

# 2020 MISSOURI STUDENT SURVEY

**UMSL | MIMH**  
Missouri Institute of Mental Health



Missouri Department of  
**MENTAL HEALTH**



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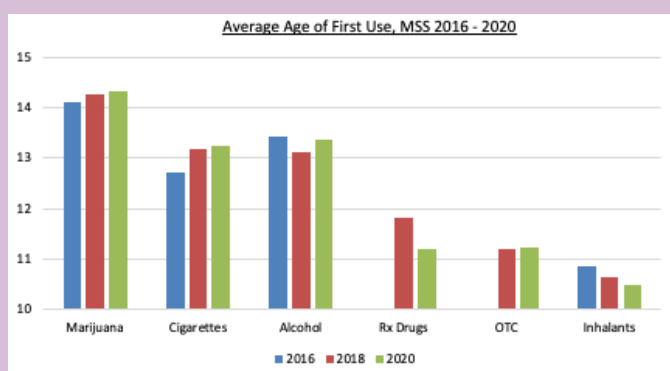
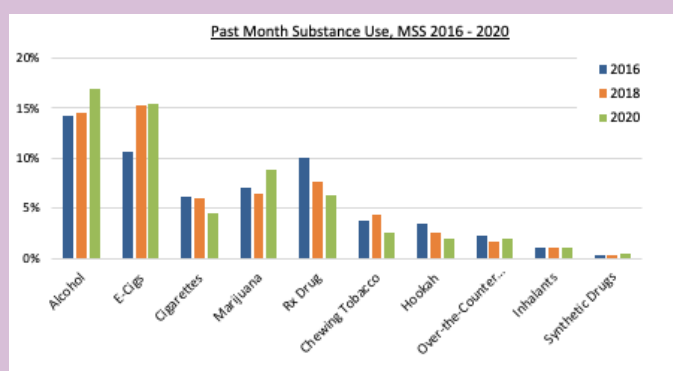
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# EXECUTIVE SUMMARY







Every even-numbered year since 2000, the Missouri Departments of Mental Health (DMH) and Elementary and Secondary Education (DESE) conducts Missouri Student Survey (MSS) to monitor substance use and related behaviors among adolescents. 96 middle and high schools in the state were selected to be a part of the statewide random sample. Of these, a total of 45 (47%) schools with 2,324 students participated in the 2020 MSS. Gender, grade (middle school, high school), race/ethnicity, and school size category (small, medium, large) were weighted to reflect statewide demographic. A summary of the results from this random sample of the MSS is explained in this report.

## 2020 SUBSTANCE USE AND AGE OF FIRST USE: COMPARISON OVER TIME



Trends show an increase in past month alcohol, e-cigarettes, and marijuana use. The use of cigarettes, hookah, and prescription drugs have reduced since 2016. Inhalants were used at an earlier age than other drugs. An upward trend is seen in age of first use for marijuana and cigarettes. For prescription drugs and inhalant use, the trend inclines towards younger age.

## SUBSTANCE USE COMPARISON: MISSOURI VS. NATIONAL SAMPLE

Substance	 Alcohol	 E-Cigarette	 Marijuana	 Cigarette	 Prescription Drugs	 Methamphetamine
<b>Lifetime%</b>	35.3	38.0	16.9	15.0	9.4	0.7
<b>MO</b>	26.3	50.1	15.4	9.6	-	0.3
<b>US</b>						
<b>30-Day%</b>	17.0	21.1	8.9	4.5	6.3	-
<b>MO</b>	9.0	32.7	6.7	2.7	-	0.1
<b>US</b>						

For the first time in the history of MSS, marijuana is more frequently reported as lifetime use than standard cigarettes. a decrease in standard cigarette use is also observed.

## 2020 SUBSTANCE USE DYNAMICS

### Access and availability

The students reported receiving prescription drugs primarily from their family while cigarettes, electronic cigarettes, alcohol, and marijuana were mainly obtained from a friend. Electronic cigarettes were more commonly bought online (6.8%) than standard cigarettes (3.6%).

Almost half of the students found it “very easy” or “sort of easy” to get electronic cigarettes, alcohol, and over-the-counter drugs. They also believed that marijuana is easier to obtain than prescription or synthetic drugs. Additionally, they perceive the effectiveness of law enforcement around substance abuse is low. However, over half of the surveyed youth believed that a police officer would catch someone using marijuana.

A majority of the students reported that none of their friends used alcohol, cigarettes, marijuana, or other illegal drugs in the past year. However, many students (44.5%) had at least one friend who drank alcohol and 1 in 3 (39.7%) had at least one friend who smoked marijuana.

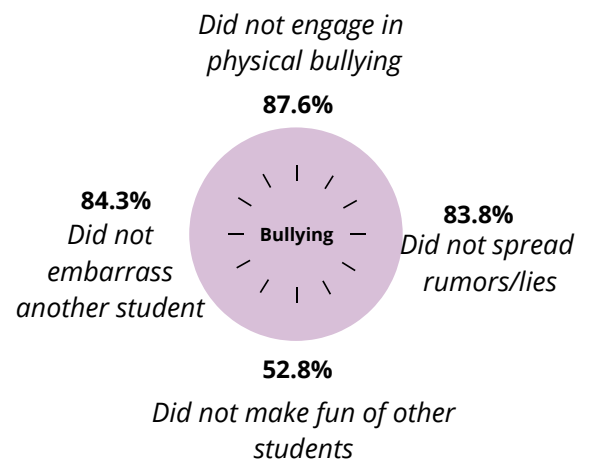
## 2020 MENTAL HEALTH DYNAMICS

### Depressive Symptoms, Self-Harm and Suicidal Ideation

72.2% students reported feeling grouchy or in a bad mood at least “sometimes”. Over half reported feeling sad (54.6%), changes in sleep (57.3%), or difficulty concentrating in school (56.7%) at least “sometimes”. Females experienced more depressive symptoms than males.

About 19% of students reported attempting to harm themselves in a deliberate, but not suicidal, way. The most common method of self-harm was “cut, scratched, or hit myself on purpose”. Females (22.1%) were much more likely than males to report self-harm (15.0%).

More than 1 in 10 youth (11.1%) surveyed reported that they considered suicide in the last year and 4.9% made a plan to attempt suicide.



### Peer Victimization

On being asked if they were bullied on the school property in the past year, High school students in Missouri reported being bullied in school in the past year more than that observed on the National Survey, YRBS.

MSS, 2020: 26.2%  
YRBS, 2019: 19.5%

Approximately 1 in 4 were unsure of where to get help, and a similar number didn't feel like they had healthy coping mechanisms.

# CHAPTER 1 – INTRODUCTION



In order to track trends in adolescent risk behaviors the Missouri Department of Mental Health (DMH) and Department of Elementary and Secondary Education (DESE) have conducted the Missouri Student Survey (MSS) every even numbered year since 2000. The first MSS, conducted by Research Triangle Institute on behalf of the DMH, was funded by the U.S. Department of Health and Human Service's Substance Abuse and Mental Health Services Administration (SAMHSA). Since then, the MSS has been funded by the DMH and analysis conducted by the Missouri Institute of Mental Health (MIMH). Beginning in 2016, MIMH coordinated the data collection as well. All public middle and high schools are asked to participate by surveying at least one classroom per grade. Beginning in 2018, private schools were also allowed to opt in, although participation from this group is low. This report describes the results of this survey.

The 2020 survey involves two levels of sampling. A random sample, selected for equal geographical distribution, was used to estimate prevalence rates for the entire state. A convenience sample was used to determine the county level data. Students who were part of the random sample were also automatically included in the convenience sample.

## **Participants**

**Statewide Random Sample:** A total of 96 schools (48 middle and 48 high) were selected to be part of the random sample. Of these, 45 (47%) schools with 2,324 students participated in the 2020 MSS. Gender, grade (middle school, high school), race/ethnicity, and school size category (small, medium, large) were weighted to reflect statewide demographics. All data in this report are from the random sample.

**County Level Convenience Sample (not included in this report):** The 2020 MSS was administered to students in grades 6-12. After data cleaning the sample size equaled 86,821 representing 93 counties (81%). Convenience samples were used in all MSS reports prior to 2016.

## **Methods**

Presented in this report are the results of the 2020 MSS, which assesses substance use and other health-risk behaviors among 6<sup>th</sup> through 12<sup>th</sup> graders attending public schools across the state. The numbers in this report reflect a random sample at the state level (38% response rate). Data were weighted to more accurately reflect the population demographics (See Appendix B). Of note, schools closed unexpectedly during the final two weeks of the planned survey window due to the COVID-19 pandemic, which lead to a smaller-than-anticipated response rate.



Given the extremely large sample size of the weighted dataset, statistical analysis proved challenging. The statistical power of this dataset was so large that even the most minuscule change was regarded as statically significant even though it may not be a meaningful difference. When this occurs, confidence intervals (CIs) are typically referred to instead; however, the weighting protocol used produces that CIs are very tight which means that this method also cannot be used. Given this, trends will be discussed, but there was some subjectivity in determining how much of a difference was “meaningful”.



Data in this report are drawn from the Statewide Random Sample. To obtain County-Level data, see <https://seow.dmh.mo.gov>

# CHAPTER 2 – ALCOHOL, TOBACCO, & OTHER DRUGS






## Trends in Lifetime & Past Month Substance Use

### Substance Use Comparisons with a National Sample

In both Missouri and the United States, alcohol lifetime use was higher than all other drugs, followed by both forms of cigarette and marijuana use. For the first time in MSS history, marijuana was more frequently reported as lifetime use than standard cigarettes, reflecting a decrease in standard cigarette use (lifetime marijuana has been relatively consistent over the last several administrations). Lifetime and 30-day use rates were higher in Missouri than nationally for alcohol, cigarettes, marijuana, and chewing tobacco. However, lifetime inhalant use was higher nationally than in Missouri.

National data were taken from the National Survey on Drug Use and Health for youth age 12-17 years (NSDUH, 2018). Some substances are blank because the survey does not collect this data.


Percentage of Substance Use in Missouri Users (6-12<sup>th</sup> grade) and the United States Users (12-17 years)

	Missouri (MSS)		United States (NSDUH)	
	Lifetime	30-day	Lifetime	30-day
Alcohol 	35.3%	17.0%	26.3%	9.0%
E-Cigarettes 	29.7%	15.5%	-	-
Marijuana 	16.9%	8.9%	15.4%	6.7%
Cigarettes 	15.0%	4.5%	9.6%	2.7%
Prescription Drugs 	9.4%	6.3%	-	-
Chewing Tobacco	6.1%	2.5%	5.0%	1.1%
Hookah	5.3%	1.9%	-	-
Over-the-Counter Meds	3.8%	2.0%	-	-
Inhalants	2.3%	1.0%	8.5%	0.7%
Synthetic Drugs	1.0%	0.5%	-	-
Hallucinogens	2.2%	-	2.3%	0.6%
Cocaine	1.2%	-	0.7%	0.0%
Club Drugs	1.0%	-	-	-
Methamphetamine	0.7%	-	0.3%	0.1%
Heroin	0.3%	-	0.1%	0.0%



E-cigarette data was not covered in the NSDUH, but was collected through the Youth Risk Behavioral Survey (YRBS, 2019) for high school youth only. The 2019 YRBS report indicated e-cigarette use among Missouri high school students was lower than the national average.

YRBS Percentage of Substance Users in Missouri and the United States, High School ONLY

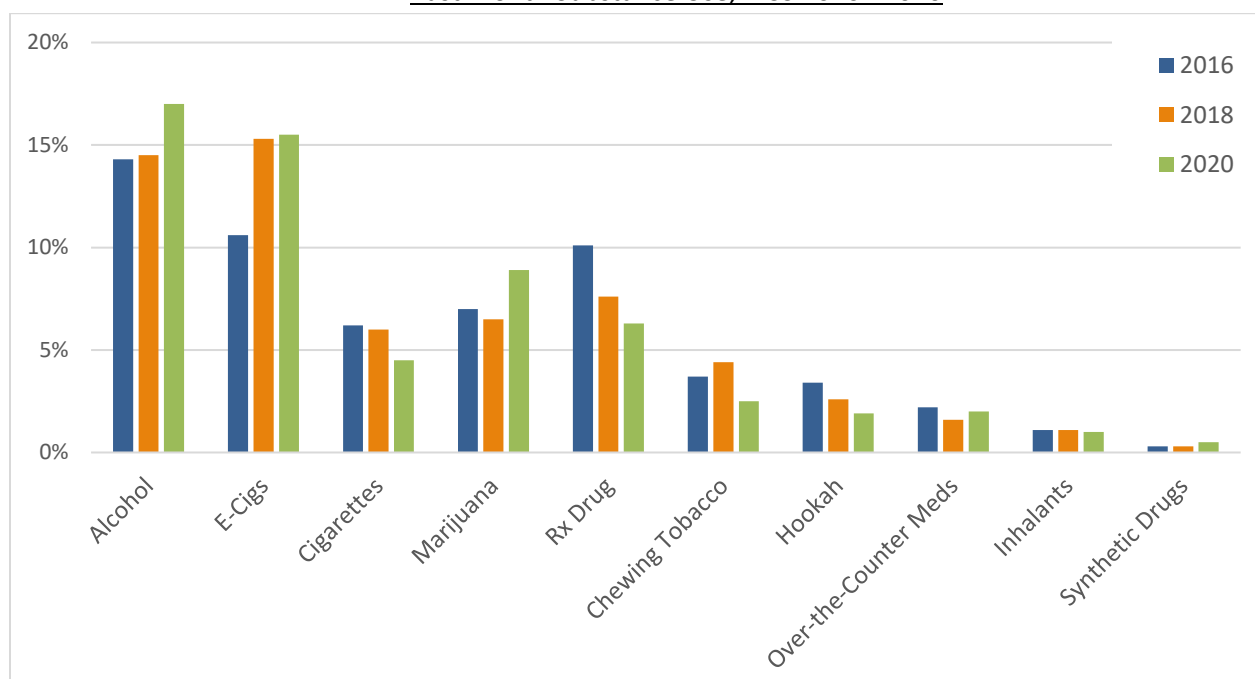
	Missouri (MSS)		United States (YRBS)	
	Lifetime	30-day	Lifetime	30-day
<i>E-cigarettes</i> 	38.0%	21.1%	50.1%	32.7%

## 2020 Substance Use Comparison over Time

The MSS statewide random sample has data for three time points (2016, 2018, and 2020). Statistical comparisons can be made over time and provide information on trends.

E-cigarettes remain higher than 2016 although are at similar levels to 2018. Trends are also showing an increase in both past month alcohol and marijuana use. Chewing tobacco, which had increased in 2018, is now lower than 2018 levels. Cigarettes, prescription drugs and hookahs all show a decrease from 2016.

Past Month Substance Use, MSS 2016 - 2020<sup>1</sup>

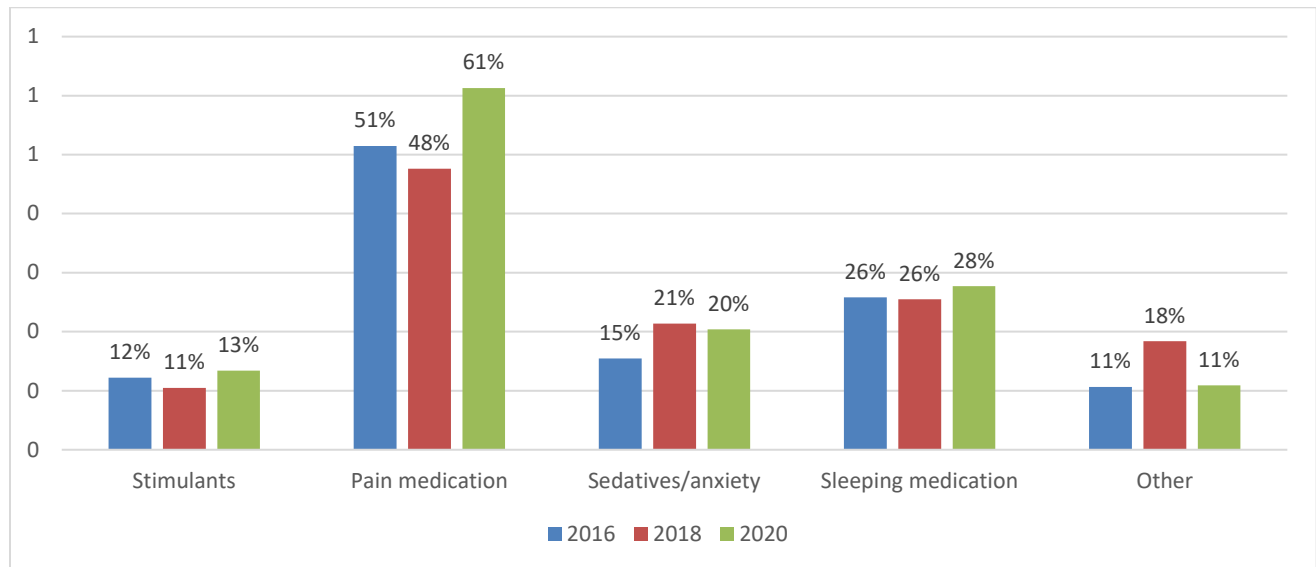


<sup>1</sup> See Appendix B for data tables

## Types of Prescription Drugs Misused over Time

When looking at the types of prescription drugs misused over time, pain medications decreased in 2018 but spiked in 2020.

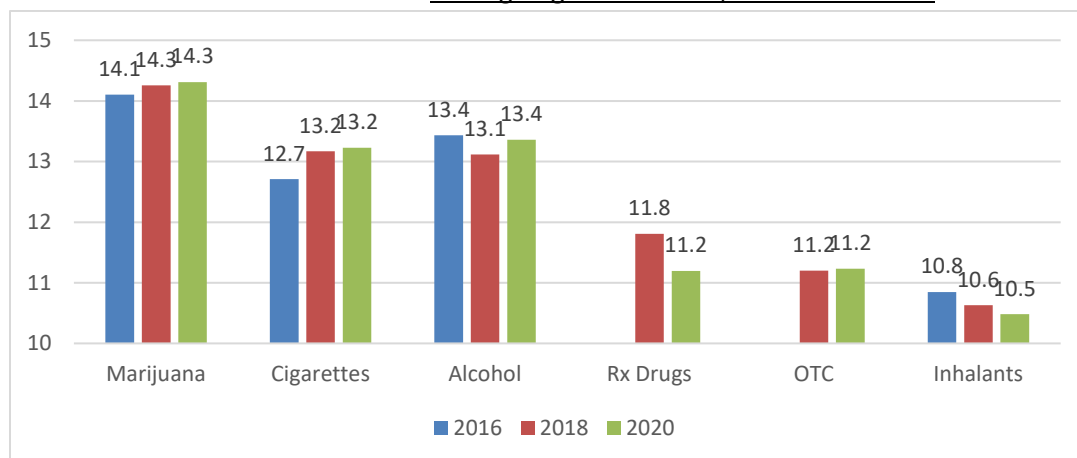
Types of Prescription Drugs Misused, MSS 2016 - 2020



## Age of First Substance Use over Time

Data for age of first use show that inhalants were used at an earlier age than other drugs, while first use of marijuana had the highest age. Age of first use trended upward for both marijuana and cigarettes. However, age of first use is trending younger for prescription drug misuse and inhalant use.

Average Age of First Use, MSS 2016 - 2020

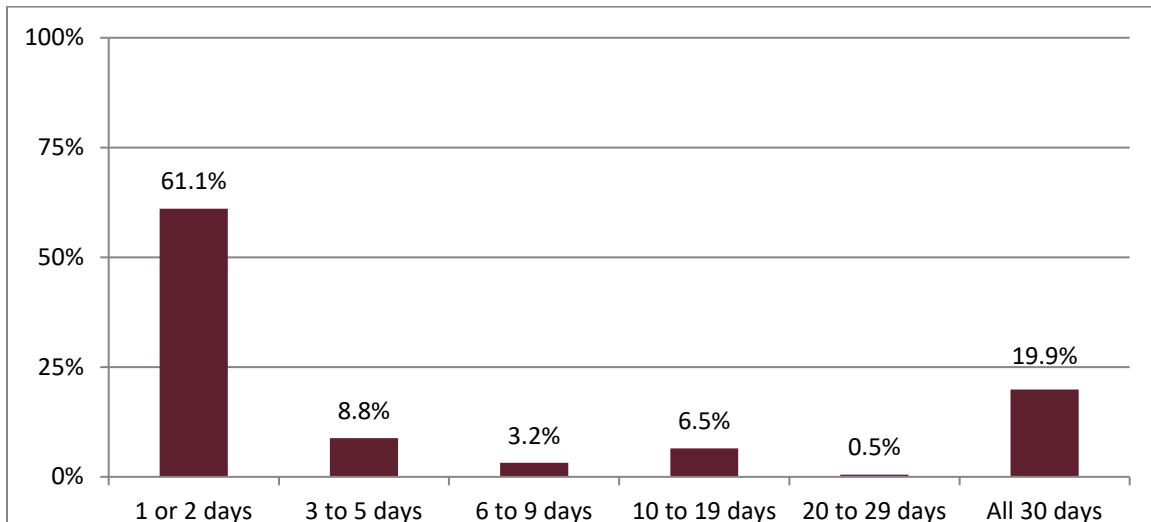


## Substance Use Extent & Circumstances

### **Tobacco**

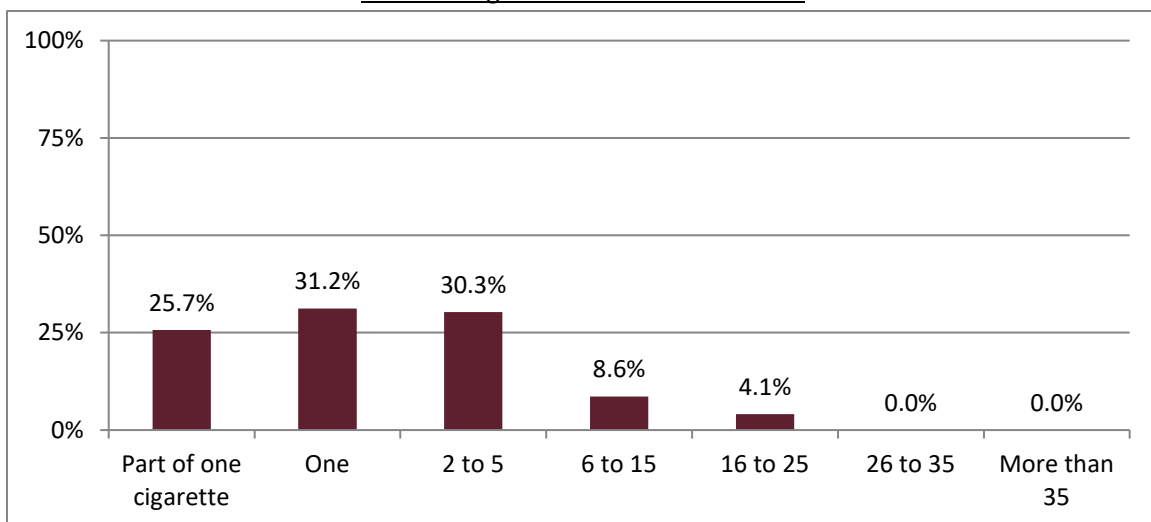
Among students who reported that they smoked standard cigarettes, most (61.1%) smoked only one or two days out of the month, followed by daily smoking (19.9%), and then 3 to 5 days (8.8%).

Number of Days of Use Among Youth Who Had Smoked Cigarettes in the Past Month



Among youth who smoked a cigarette in the 30 days prior to the survey administration, 71.5% tried to quit smoking at some point in their life; about half (50.3%) did so successfully. The majority (87.2%) of youth who smoked in the past 30 days reported smoking five or fewer cigarettes on the days that they did smoke. Very few (12.7%) reported smoking more than 15 cigarettes a day.

Average Number of Cigarettes Smoked per Day (on Days That Cigarettes Were Smoked) Among Youth Who Had Smoked Cigarettes in the Past Month



Most youth who smoked obtain cigarettes from a friend, followed by taking them without permission, and buying them from a store. As students could select multiple options, the total adds to more than 100%.

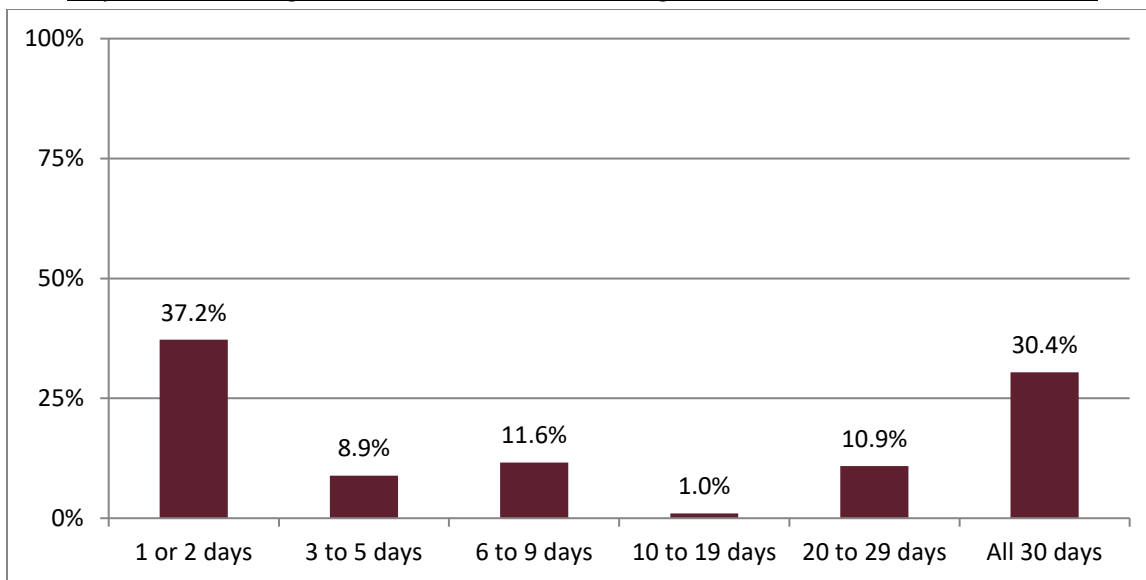
How Cigarettes were Accessed, of Those Who Reported Past Month Use

	Endorsed
<i>A friend gives or sells it to me</i>	49.6%
<i>I take it without permission</i>	28.3%
<i>I buy them from the store</i>	21.9%
<i>A family member gives or sells it to me</i>	20.4%
<i>I ask a stranger to buy them for me</i>	6.8%
<i>I buy it online</i>	3.6%
<i>Other</i>	13.5%

A little more than a quarter (28.3%) of cigarette smokers had smoked on school property during the past 30 days; most smoked on school property once or twice. Approximately 4% of smokers reported smoking on school property daily.

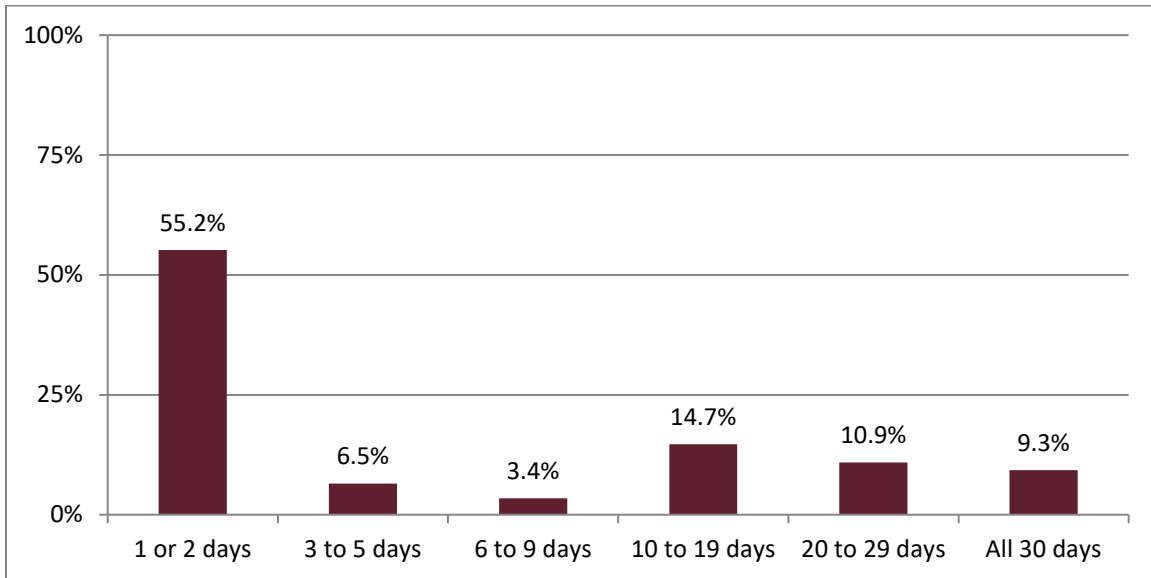
The use of chewing tobacco was similar to cigarette use, with the largest percentage of youth using only 1 or 2 days (37.2%) a month or daily (30.4%).

Days of Use Among Youth Who Had Used Chewing Tobacco or Snuff in the Past Month



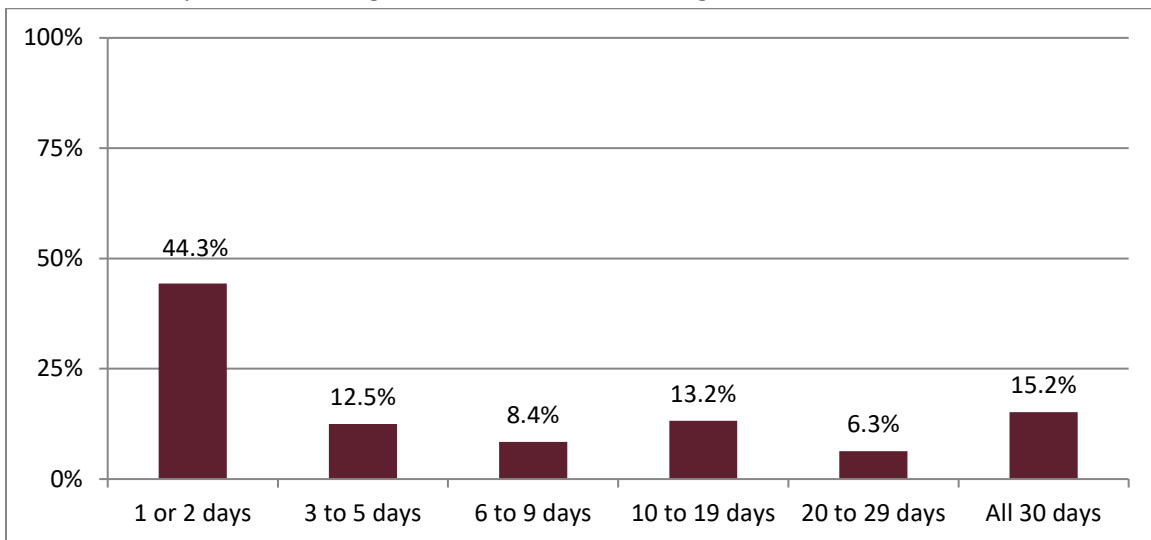
The majority of students who reported using a hookah only did it on an occasional basis. However, approximately 1 in 10 reported using daily.

Days of Use Among Youth Who Had Used Hookahs in the Past Month



Youth who reported using e-cigarettes have a similar use pattern to standard cigarettes. The most students (44.3%) smoked only one or two days out of the month, followed by daily smoking (15.2%).

Days of Use Among Youth Who Had Used E-Cigarettes in the Past Month



Most youth who smoked e-cigarettes obtained them from a friend, followed by buying purchasing from a store. A larger number of youth reported buying e-cigarettes online (6.8%) verses standard cigarettes (3.6%).

How E-Cigarette Products were Accessed, of Those Who Reported Past Month Use<sup>2</sup>

	Endorsed
<i>A friend gives or sells it to me</i>	71.1%
<i>I buy them from the store</i>	17.3%
<i>A family member gives or sells it to me</i>	15.0%
<i>I ask a stranger to buy them for me</i>	9.1%
<i>I buy it online</i>	6.8%
<i>I take it without permission</i>	6.0%
<i>Other</i>	11.2%

E-cigarettes use liquids, although the content of these liquids may vary. The majority of them contain nicotine. Many students reported using nicotine (71.0%) and flavor only products (46.2%) in their e-cigarettes at least sometimes. More than 1 in 10 reported at least sometimes using marijuana in their e-cigarette.

Product Used in E-Cigarette, Mod, or Vape for Those Who Reported Using E-Cigarette in Their Lifetime

	Endorsed
<i>Nicotine</i>	71.0%
<i>Flavor only</i>	46.2%
<i>Marijuana</i>	22.6%
<i>Other</i>	3.7%

About one out of five current tobacco users (17.4%) reported using more than one form of tobacco. Of those who reported currently smoking standard cigarettes, 72.2% also reported current e-cigarette use, 37.9% reported current chew use, and 21.6% reported current hookah use. Of those who reported currently smoking e-cigarettes, 13.2% were also chew users and 9.4% were also hookah users.

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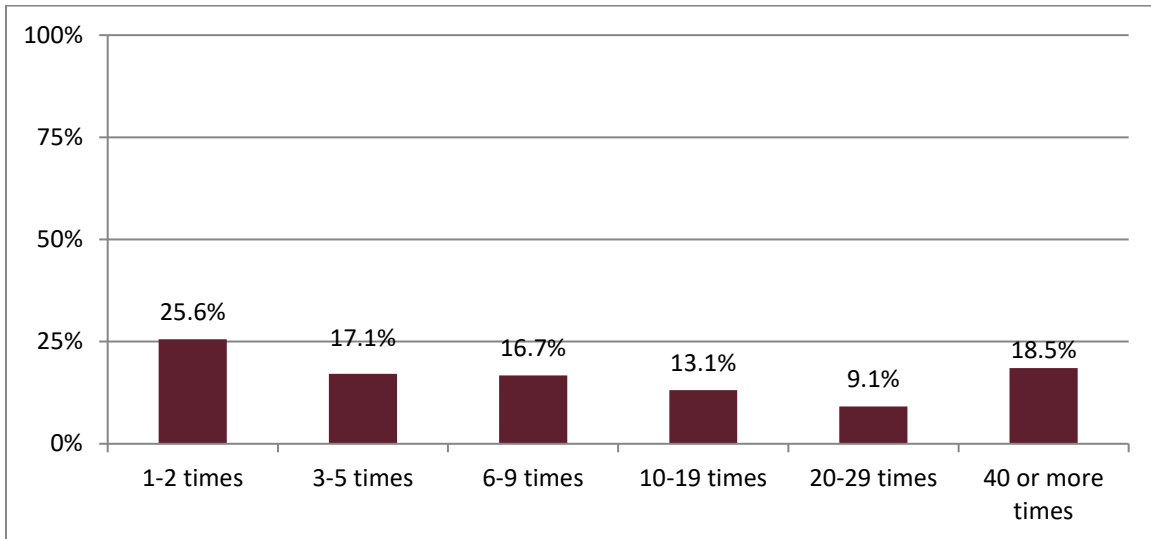
<sup>2</sup> As students could select multiple options, tables on access and subcategories of substances can add to more than 100%





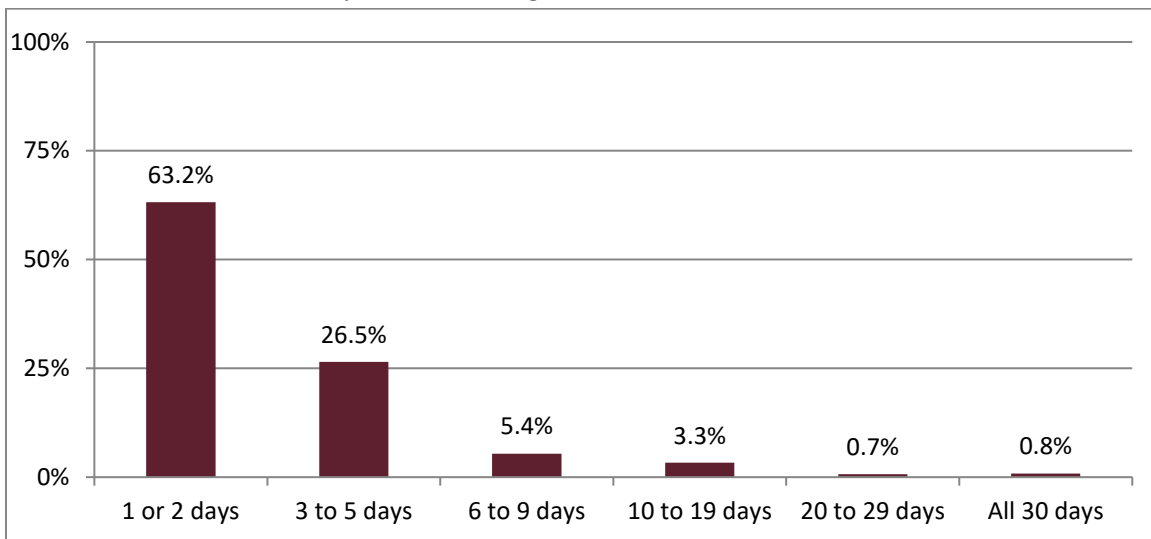
Of the students who reported having had at least one drink in their lifetime, about one-quarter (25.6%) only consumed alcohol on 1-2 occasions. However, almost 1 in 5 had consumed alcohol 40 or more times. This excludes “when you only had a sip or two from a drink or if you drank alcohol only for religious purposes”.

Number of Times Youth Had at Least One Drink of Alcohol in Their Lifetime, Among Those Who Had a Drink at Least Once



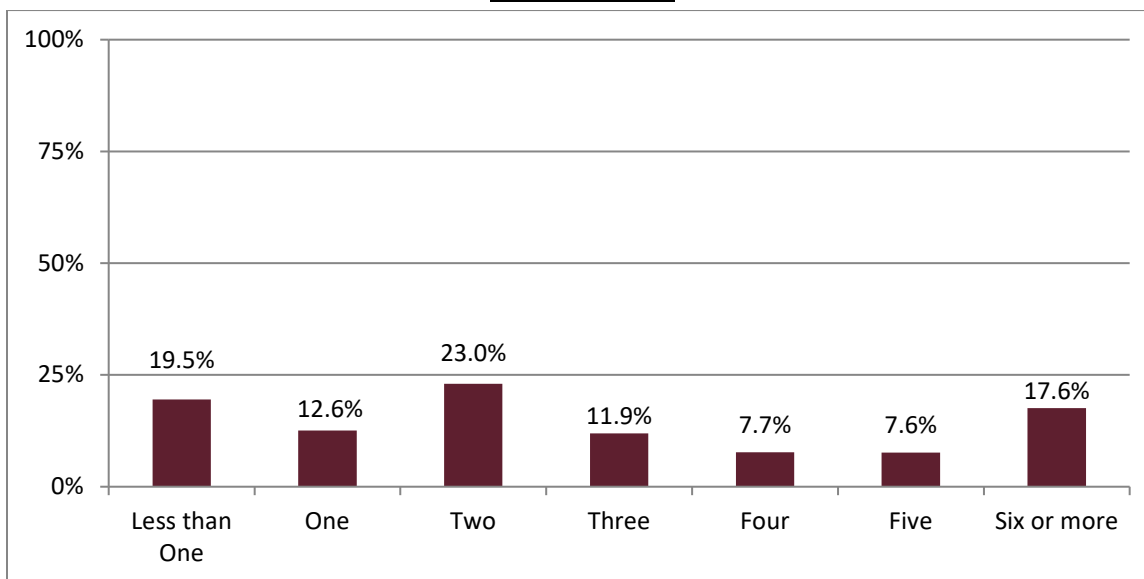
Among those youth who reported drinking in the last 30 days, the majority (63.2%) drank on only 1 or 2 days. Among those youth, 5.7% reported drinking on school property at least once.

Days of Use Among Past Month Alcohol Users



Four out of 10 (41.0%) students who reported past month alcohol use also reported having five or more drinks (binge drinking) in the past month. Taken with the information presented below on the average number of drinks per occasion, this indicates that while most youth only drink 1-2 days a month, when they do drink many of them drink heavily.

Average Number of Drinks Consumed (on Days That Alcohol Was Used) Among Youth Who Consumed Alcohol in the Past Month



Overall, in the past 30 days, a small percentage (3.4%) of students 16 and older reported drinking while driving, compared to 5.5% at the national level (YRBS, 2019). Seventeen percent (17.0%) of all students surveyed reported that they had ridden in a car with someone who had been drinking, which is similar to the national data (16.7%) (YRBS, 2019). However, for students who reported drinking in the past 30 days, 35.4% rode with someone who had been drinking and 12.2% reported drinking and driving. The number of students who reported drinking and driving or riding with someone who had been drinking has remained relatively stable between 2016 and 2020.

While friends remained the primary source to get alcohol, family members, and having taken it without permission were also common sources.

How Alcohol was Accessed, of those who reported Past Month Use

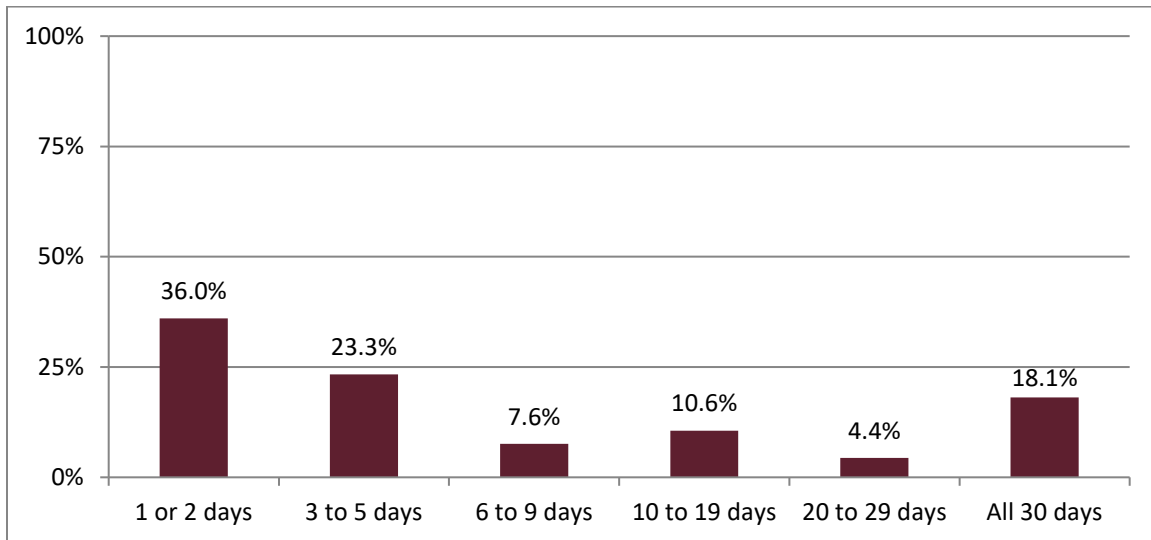
	Endorsed
<i>A friend gives or sells it to me</i>	55.5%
<i>A family member gives or sells it to me</i>	39.8%
<i>I take it without permission</i>	19.6%
<i>I ask a stranger to buy them for me</i>	9.9%
<i>I buy them from the store</i>	7.6%
<i>I buy it online</i>	1.5%
<i>Other</i>	13.2%

## Marijuana



Of youth who smoked marijuana in the past month, a little over 1 in 3 (36.0%) youth reported smoking one or two days in the past month, while 18.1% reported daily use.

Number of Days of Use Among Past Month Marijuana Smokers



About 1 in 5 (20.4%) past month users smoked marijuana had done so while on school property. This is much higher than the percentage who reported drinking alcohol on school property (5.7%) but lower than those who reported smoking cigarettes on school property (28.3%).

Most students reported smoking and/or vaping marijuana, although edibles and dabbing, etc. were also relatively common. Note that categories have changed slightly since 2018 to reflect new ways of using marijuana.

Methods of Using Marijuana

	Endorsed
<i>Smoke it (blunt, pipe, hookah, etc.)</i>	88.8%
<i>Vape it (dry plant, THC oil, extracts, etc.)</i>	49.7%
<i>Eat it (edibles)</i>	51.8%
<i>Dabbing / Wax / Hash Oil</i>	39.2%
<i>Other</i>	5.1%

The majority of students got their marijuana from a friend. They also obtained it from a dealer and family members.

How Marijuana was Accessed, of Those Who Reported Past Month Use

	Endorsed
<i>A friend gives or sells it to me</i>	79.8%
<i>I buy it from a dealer</i>	47.4%
<i>A family member gives or sells it to me</i>	20.7%
<i>I take it without permission</i>	8.0%
<i>I buy it online</i>	4.0%
<i>A stranger gives or sells it to me</i>	3.8%
<i>Other</i>	7.6%

## Prescription Drug Misuse

Among youth who misused prescription drugs at least once (9.4%), pain medication was the most commonly misused substance; not surprisingly, the number one reason given for misusing prescription drugs was to reduce and/or manage pain. Similarly, sleeping medication was the second most misused prescription drug and the second most common reason given was to help with sleep. These patterns are the exact same as those seen in the 2016 and 2018 surveys.

Overall, current prescription drug misuse has decreased since 2016. However, there was a significant decrease in pain medication. There was also an increase in students indicating “Other”.

### Type of Prescription Misused in the Past Year, of Those Who Reported Lifetime Misuse of Prescription Drugs

	Endorsed
<i>Pain medication</i>	61.3%
<i>Sleeping medication</i>	27.7%
<i>Sedatives / anxiety medication</i>	20.4%
<i>Stimulants</i>	13.4%
<i>Other</i>	10.9%

### Reasons for Use that were Important to Those Who Reported Lifetime Misuse of Prescription Drugs

	Endorsed
<i>To reduce and/or manage pain</i>	34.8%
<i>To help me sleep</i>	30.0%
<i>To help with stress</i>	23.0%
<i>To help me feel better or happier</i>	18.7%
<i>To increase my energy</i>	14.1%
<i>To have a good time</i>	11.7%
<i>Curiosity</i>	7.6%
<i>To help with weight loss</i>	7.1%
<i>To improve academic performance</i>	4.3%
<i>To fit in with friends</i>	4.0%

Prescription drugs were the only substance that students reported getting primarily from their family; all other substances were primarily obtained from a friend. The number of those youth who were getting it from a family member (43.1% in 2018 and 28.6% in 2020) and taking it without permission (10.2% in 2018 and 5.6% in 2020) has decreased, which may indicate that prescription drug disposal methods may be helping decrease the availability of prescription drugs. This should be interpreted cautiously because there are only 2 data points.

How Prescription was Accessed, of Those Who Reported Past Month Use

	Endorsed
<i>A family member gives or sells it to me</i>	28.6%
<i>A friend gives or sells it to me</i>	12.3%
<i>I take it without permission</i>	5.6%
<i>A stranger gives or sells it to me</i>	3.5%
<i>I buy it online</i>	2.3%
<i>Other</i>	16.4%










## Factors Associated with Adolescent Substance Use

### Substance Availability

About half of youth perceived e-cigarettes, alcohol, and over-the-counter drugs as either “very easy” or “sort of easy” to obtain. Marijuana was considered easier to get than prescription or synthetic drugs, with almost 2 out of 5 students believing marijuana was easy to get. Illegal drugs were perceived as the most difficult to get, with a large majority (89.6%) reporting that they were “sort of hard” or “very hard” to get.




Youth Perception of Substance Availability

	Very Easy	Sort of Easy	Sort of Hard	Very Hard
<i>Over-the-Counter Drugs</i>	31.4%	19.5%	14.3%	34.9%
<i>Alcohol</i> 	31.1%	21.3%	16.8%	30.9%
<i>E-Cigarettes</i> 	27.1%	21.5%	14.9%	36.4%
<i>Cigarettes</i> 	18.9%	20.6%	21.8%	38.7%
<i>Marijuana</i> 	20.9%	17.1%	14.7%	47.3%
<i>Prescription Drugs</i> 	9.7%	11.4%	21.2%	57.7%
<i>Synthetic Drugs</i>	9.1%	9.3%	17.6%	63.9%
<i>Other Illegal Drugs</i>	4.5%	5.9%	13.9%	75.7%

### Law Enforcement

The perceived effectiveness of law enforcement around substance use was low. Most youth did not believe that the police would catch someone using cigarettes or alcohol in their neighborhood. This was fairly consistent across all drugs. However, more than half (58.3%) of students believed that a police officer would catch someone using marijuana.

Percentage of Youth Who Think the Police Would Catch Students Using Substances in Their Neighborhood





	No!	no	yes	Yes!
<i>Cigarettes</i> 	29.1%	43.9%	18.7%	8.2%
<i>Alcohol</i> 	31.9%	40.1%	19.4%	8.7%
<i>Marijuana</i> 	17.4%	24.3%	30.4%	27.9%

## Peer Substance Use and Perception of Substance Use

The majority of youth surveyed reported that none of their friends used alcohol, cigarettes, marijuana, or other illegal drugs in the past year. Many youth (44.5%), however, did have at least one friend who drank alcohol while 1 in 3 (39.7%) had at least one friend who smoked marijuana.






For alcohol and marijuana, young people tended to either have no friends who used or 4+ friends that used. This indicated that for many youth with friends that used, a large portion of their social group engaged in substance use.

Percentage of Youth Who Have Friends Who Use Substances

	0 friends	1 friend	2 friends	3 friends	4 or more friends
Alcohol 	55.4%	10.0%	9.0%	4.9%	20.6%
Marijuana 	60.3%	11.5%	6.4%	4.8%	17.0%
Cigarettes 	75.8%	11.1%	4.8%	2.1%	6.2%
Prescription Drugs 	88.0%	6.3%	2.2%	1.3%	2.1%
Other Illegal Drugs	88.5%	6.1%	2.7%	0.9%	1.7%





The majority of students felt like their friends would consider all types of substance use wrong. While marijuana was the least likely for students to be concerned about peer judgment, nearly 7 out of 10 still thought their friends would disapprove.

Youths' Perception of How Wrong their Friends consider Substance Use

	Not wrong at all	A little bit wrong	Wrong	Very wrong
Prescription Drugs 	5.1%	6.5%	16.1%	72.2%
Smoke Cigarettes 	8.7%	8.4%	18.5%	64.5%
Used E-Cigarettes 	19.7%	16.8%	18.4%	45.1%
One or two drinks every day 	11.3%	14.7%	22.6%	51.3%
Marijuana 	18.0%	14.6%	15.6%	51.8%










Similarly, while students may have friends who used substances, the great majority of them believed that their friends would not see them as “very cool” or “pretty cool” if they used. Cigarettes were seen as the least cool substance.

<u>Percentage of Youth who Indicate Level of Coolness</u>				
	<b>Very Cool</b>	<b>Pretty Cool</b>	<b>A Little Cool</b>	<b>Not at all Cool</b>
<i>Smoked Cigarettes</i> 	3.7%	6.3%	13.4%	76.5%
<i>Smoked Marijuana</i> 	11.5%	14.4%	19.4%	54.7%
<i>Used E-Cigarettes</i> 	9.4%	16.9%	21.3%	52.4%
<i>Drank Alcohol</i> 	10.2%	17.3%	23.1%	49.4%

## Perceived Risk of Harm from Substances

Alcohol usage (without a specified dosage) and marijuana were seen as the least risky substances. As alcohol dosage was specified, however, it was seen as more risky. Prescription drug misuse, synthetic drug use, and other illegal drug use was perceived as the most risky.









<u>Youths’ Perception of Risk of Harm from Using Substances</u>				
	<b>No Risk at All</b>	<b>Slight Risk</b>	<b>Moderate Risk</b>	<b>Great Risk</b>
<i>Any alcohol use</i> 	10.6%	35.9%	29.2%	24.3%
<i>Marijuana</i> 	18.5%	20.7%	19.8%	41.0%
<i>One or two drinks nearly every day</i> 	11.2%	23.9%	32.5%	32.4%
<i>E-Cigarettes</i> 	10.7%	22.5%	28.1%	38.7%
<i>Five or more drinks once or twice a week</i> 	8.4%	15.7%	29.5%	46.4%
<i>Over the Counter Drugs</i>	8.7%	14.7%	27.7%	48.9%
<i>Cigarettes, 1+ packs per day</i> 	7.2%	11.7%	20.3%	60.8%
<i>Prescription Drugs</i> 	5.9%	8.3%	20.1%	65.7%
<i>Synthetic Drugs</i>	6.9%	6.3%	16.9%	69.9%
<i>Other Illegal Drugs</i>	5.3%	4.3%	12.5%	78.0%

## Morality of Substance Use

Similar to responses for the perception of harm, alcohol use was most accepted substance. However, it should be noted that the majority of students in every question said that it would be “very wrong” to use substances. When combined with “wrong”, over 7 out of 10 students disagreed with substance use in all categories except alcohol. Almost all disagreed with the use of over the counter, prescription, and other illegal drugs.

More youth perceived alcohol as “very wrong” when it was used every day or heavily once or twice a week. However, for marijuana, the frequency of use did not affect how wrong it was perceived.

Youths’ Perception of Wrongfulness of Substance Use

	Not wrong at all	A little bit wrong	Wrong	Very wrong
Any type of alcohol 	12.9%	20.0%	19.0%	48.0%
Any use of marijuana 	12.0%	12.5%	14.5%	61.0%
E-Cigarettes 	8.6%	14.3%	18.7%	58.4%
Once or twice a week, smoke marijuana 	9.8%	10.8%	15.1%	64.3%
One or two drinks every day 	5.4%	9.7%	20.5%	64.4%
Cigarettes 	4.5%	7.9%	15.5%	72.2%
Five or more drinks once or twice a week 	5.1%	7.3%	18.5%	69.2%
Over the Counter Drugs	3.4%	4.7%	13.2%	78.7%
Prescription Drugs 	2.2%	3.3%	9.9%	84.6%
Other Illegal Drugs	1.7%	2.5%	7.6%	88.2%



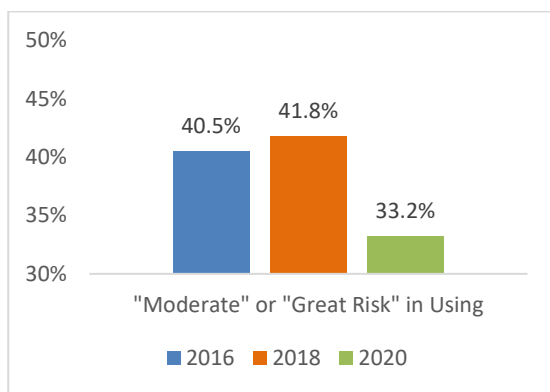
## Change Over Time

This section details changes in risk and protective factors from 2016 to 2020. Only large changes were noted, so if a variable is not listed, it did not change from the 2018 report.

With the exception of ease of obtaining standard cigarettes and the likelihood of police catching someone using marijuana, all of the changes moved in the less desirable direction.

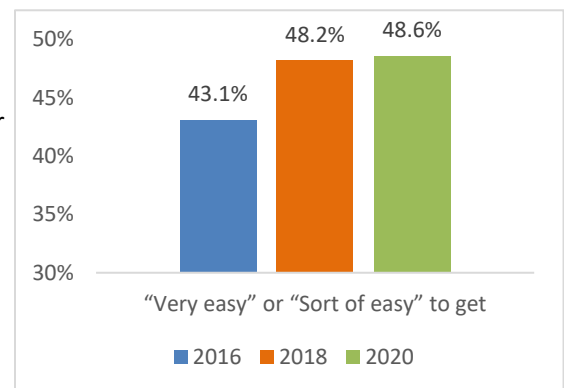
Note that scales vary in each graph to allow the maximum amount of detail to be shown.

### E-Cigarettes (E-Cigs)

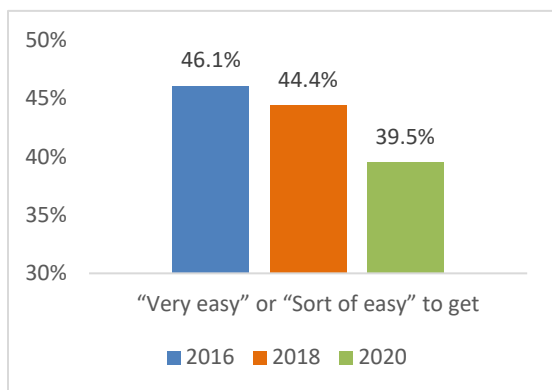


Students' perception of the risk of using e-cigarettes decreased over time.

Students' perception of the ease of obtaining e-cigarettes increased over time.

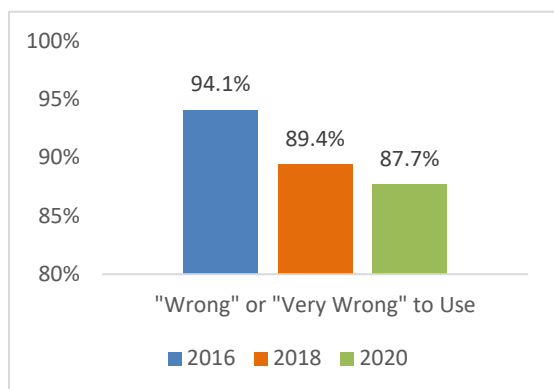
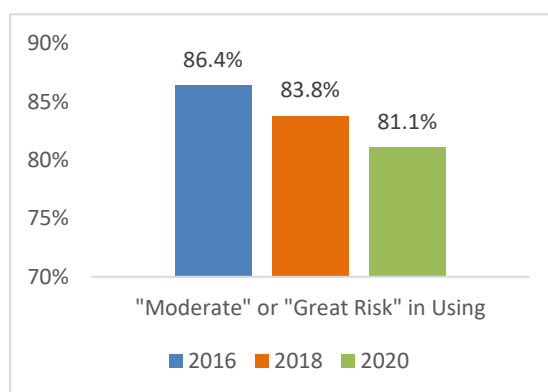


## Standard Cigarettes



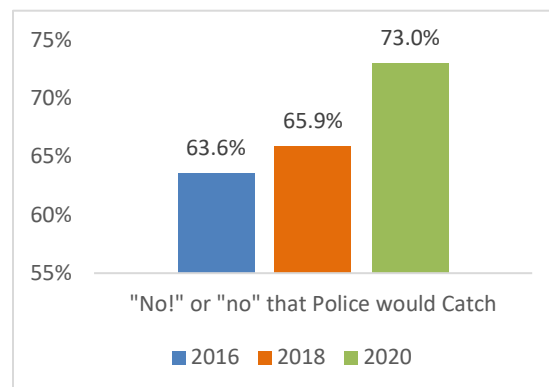
Students' perception of the ease of obtaining standard cigarettes decreased over time.

Students' perception of the risk of using standard cigarettes decreased over time.



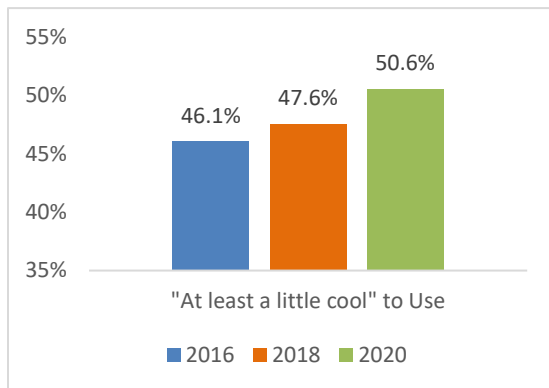
Students' perception of how wrong it would be to smoke standard cigarettes decreased over time.

Students' perception that police would NOT catch someone smoking standard cigarettes increased over time.



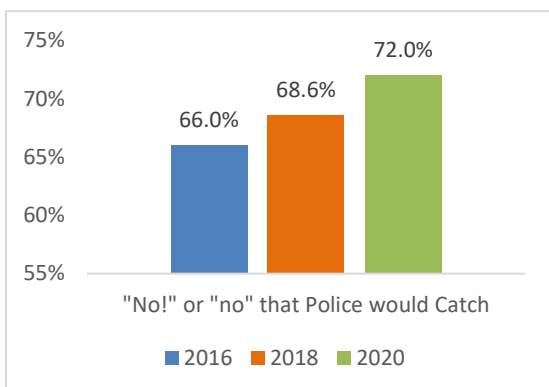
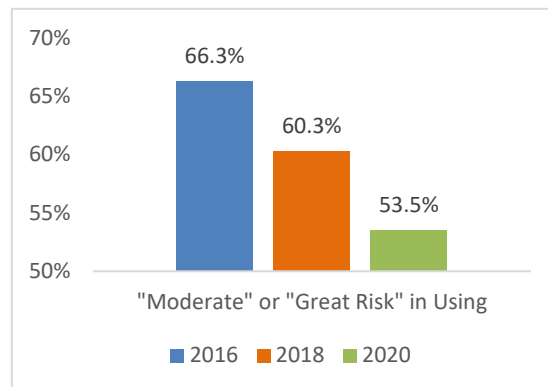


## Alcohol



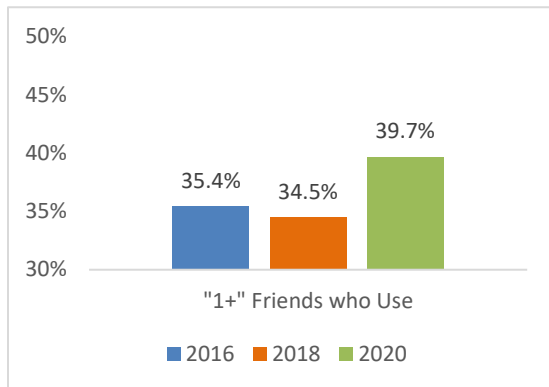
Students' perception of it being cool to drink alcohol increased over time.

Students' perception of the risk of drinking alcohol decreased over time.



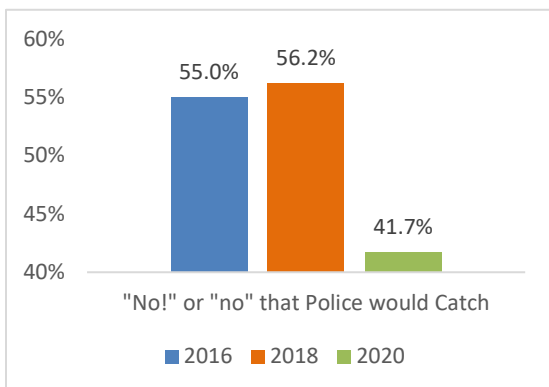
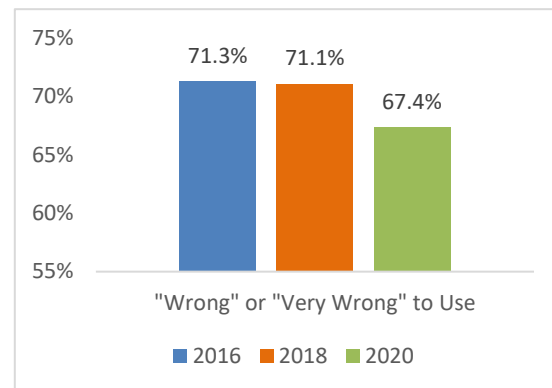
Students' perception that police would NOT catch someone drinking alcohol increased over time.

## Marijuana



The number of students who reported at least one friend who was using marijuana increased since 2016.

Students' perception of how wrong it would be to use marijuana decreased over time.



Students' perception that police would NOT catch someone using marijuana decreased since 2016.

## Prescription Drug Misuse

There was no change in underlying risk and protective factors for prescription drug misuse, as measured by the survey.

# CHAPTER 3 – PROBLEM BEHAVIORS

This chapter contains information on self-reported problem behaviors, including emotional and physical bullying, physical aggression, and experience with weapons. It also includes information on factors associated with adolescent problem behaviors, such as rebellious and defiant attitudes, weapon availability, perceived law enforcement response to weapon possession, peer weapon use, and problem behavior and attitudes among the family.

## Bullying

### **Bullying Behaviors**

Youth were asked to report the number of times in the past three months they bullied others or were bullied by another student. Bullying behaviors include physical bullying (whether a student had hit, shoved or pushed another student and were not “just fooling around”) and emotional bullying (spreading mean rumors or lies, making fun of others, and embarrassing or hurting another student through the use of a cell phone or the internet).

The majority of students reported that they had not engaged in physical bullying (87.6%), spread mean rumors or lies at school (83.8%), or embarrassed another student online or via text messaging (84.3%). However, almost half (47.2%) of the youth did report making fun of other people and 4.3% reported doing this 40 or more times in the past three months. However, students who reported making fun of other people continues to decrease over time (54.1% “1+ times” in 2016, 51.1% in 2018, and 47.2% in 2020).

Frequency of Bullying Behaviors in the Past 3 Months

	<b>Never</b>	<b>1-2</b>	<b>3-5</b>	<b>6-9</b>	<b>10-19</b>	<b>20-29</b>	<b>30-39</b>	<b>40 +</b>
<i>Hit, shoved or pushed another student and were not just fooling around</i>	87.6%	8.0%	2.2%	0.8%	0.6%	0.2%	0.1%	0.5%
<i>Spread mean rumors or lies about others at school</i>	83.8%	12.7%	1.7%	0.8%	0.6%	0.2%	0.0%	0.3%
<i>Made fun of other people</i>	52.8%	27.4%	7.7%	4.2%	2.5%	0.6%	0.6%	4.3%
<i>Posted something online or sent a text that might embarrass or hurt another student</i>	84.3%	11.2%	2.7%	0.7%	0.4%	0.3%	0.0%	0.3%

## Peer Victimization

Students were asked if they were bullied on school property in the past year. Bullying was defined as “when one or more students tease, threaten, spread rumors about, hit, shove, or hurt another student over and over again. It is not bullying when two students of about the same strength or power argue, fight, or tease each other in a friendly way”. Missouri high school students reported being bullied at school in the past year slightly more than reported on the national survey (26.2%, MSS, 2020 compared to 19.5%, YRBS, 2019).

### Frequency of Peer Victimization in the Past 3 Months

	Never	1-2	3-5	6-9	10-19	20-29	30-39	40 +
<i>Been hit, shoved or pushed by another student who was not just fooling around</i>	81.0%	12.1%	3.0%	1.2%	1.1%	0.7%	0.1%	0.9%
<i>Mean rumors or lies spread about you at school</i>	56.4%	22.1%	10.7%	5.3%	2.1%	1.3%	0.1%	2.0%
<i>Made fun of by others</i>	44.0%	23.9%	12.1%	7.4%	4.5%	1.7%	1.2%	5.1%
<i>Had something embarrassing or hurtful posted online or in a text by another student</i>	74.5%	14.5%	5.1%	2.8%	1.5%	0.5%	0.0%	1.0%

## Physical Aggression & Experience with Weapons

More than 4 out of 5 students reported not engaging in a physical fight in the last year. Almost all youth reported they were not injured in a physical fight or threatened with a weapon while on school property. For those who did engage in fighting, the majority reported that they had only fought once in the past year.

### Frequency of Fighting and Being Threatened/Injured with a Weapon in the Past 12 months

	0 times	1 times	2 or 3 times	4 or 5 times	6 or 7 times	8 or 9 times	10 or 11 times	12 or more
<i>In a physical fight</i>	84.1%	8.5%	5.0%	1.2%	0.4%	0.1%	0.1%	0.5%
<i>Injured in a physical fight (required medical treatment)</i>	97.6%	1.5%	0.5%	0.2%	0.0%	0.0%	0.1%	0.1%
<i>Threatened/Injured with a weapon on school property</i>	93.3%	3.4%	1.5%	0.8%	0.3%	0.2%	0.1%	0.4%

## Rebellious & Defiant Attitudes

The large majority of youth did not report rebellious and defiant attitudes. Of the rebellious behaviors, cheating was seen as the most acceptable, with approximately 1 out of 4 students that “agreed” or “strongly agreed” with that statement.

Extent of Rebellious and Defiant Attitudes

	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Agree</b>	<b>Strongly Agree</b>
<i>I ignore rules that get in my way.</i>	41.2%	42.2%	14.0%	2.6%
<i>I do the opposite of what people tell me, just to get them mad.</i>	51.1%	34.6%	11.5%	2.9%
<i>I think sometimes it is okay to cheat at school.</i>	43.6%	31.5%	19.5%	5.4%

## Weapons - Availability, Law Enforcement, and Peer Behavior

Four out of 10 (41.7%) youth did not believe that a youth carrying a gun in their neighborhood would be caught by the police.

Extent to Which Youth Think the Police Would Catch a Kid Carrying a Gun in Their Neighborhood

	<b>No!</b>	<b>no</b>	<b>yes</b>	<b>Yes!</b>
<i>If a kid was found carrying a gun in your neighborhood, or in the area around where you live, would he or she be caught by police?</i>	17.4%	24.3%	30.4%	27.9%

While the vast majority of youth did not have a friend who carried a gun (not including use for hunting or sport), over 10% reported at least one friend had carried a gun in the past year.

Number of Friends Who Carried a Gun in the Past Year (12 months)

	<b>0 friends</b>	<b>1 friend</b>	<b>2 friends</b>	<b>3 friends</b>	<b>4 or more friends</b>
<i>How many friends you feel closest to have carried a gun (not including use of a gun for hunting or sport)?</i>	89.6%	4.6%	2.2%	1.7%	1.9%



## CHAPTER 4 – MENTAL HEALTH

### Depression

Youth were asked six questions related to depression. Most students (72.2%) reported feeling grouchy or in a bad mood at least “sometimes”. Over half reported feeling sad (54.6%), changes in sleep (57.3%), or difficulty concentrating in school (56.7%) at least “sometimes”. Feeling hopeless was reported the least (33.1% “sometimes”, “often” or “always”). This pattern has remained consistent over time.

Extent of Depressive Symptoms in the Past Month (30 Days)

	Never	Not very often	Sometimes	Often	Always
<i>Were you very sad?</i>	21.6%	23.8%	29.3%	17.1%	8.2%
<i>Were you grouchy or irritable, or in a bad mood?</i>	11.8%	16.0%	38.8%	25.2%	8.2%
<i>Did you feel hopeless about the future?</i>	42.0%	24.8%	17.6%	9.4%	6.1%
<i>Did you feel like not eating or eating more than usual?</i>	37.6%	18.2%	23.1%	12.0%	9.1%
<i>Did you sleep a lot more or a lot less than usual?</i>	23.9%	18.8%	24.7%	17.7%	14.9%
<i>Did you have difficulty concentrating on your school work?</i>	22.0%	21.3%	24.6%	16.5%	15.6%



Females consistently reported a statistically significant difference in experiencing more depressive symptoms than males.

Depressive Symptoms in the Past Month (30 Days) by Gender (Often & Always)

	Male	Female
<i>Were you sad?</i>	17.6%	32.7%
<i>Were you grouchy or irritable, or in a bad mood?</i>	24.7%	42.0%
<i>Did you feel hopeless about the future?</i>	13.2%	17.9%
<i>Did you feel like not eating or eating more than usual?</i>	15.7%	26.5%
<i>Did you sleep a lot more or a lot less than usual?</i>	26.2%	39.0%
<i>Did you have difficulty focusing on your school work?</i>	29.0%	35.2%

## Self-Harm, Suicidal Ideation & Attempts

About 19% of students reported attempting to harm themselves in a deliberate, but not suicidal, way. The most common method of self-harm was “cut, scratched, or hit myself on purpose”. Females (22.1%) were much more likely than males to report self-harm (15.0%).

Percent of Students Reporting Types of Self-Harm

	Male	Female	Overall
<i>Cut, scratched or hit myself on purpose to hurt myself</i>	9.4%	17.9%	13.9%
<i>Punched a hard object (like a wall or door)</i>	10.1%	10.8%	10.6%
<i>Pulled my hair or eyelashes</i>	1.9%	4.9%	3.5%
<i>Burned myself</i>	1.8%	3.0%	2.5%
<i>Used drugs or alcohol to hurt myself</i>	1.4%	2.8%	2.1%
<i>Swallowed more medicine than a doctor told me to take to hurt myself</i>	0.7%	3.0%	1.9%
<i>Swallowed something on purpose that was not food, drink or medicine in order to hurt myself</i>	0.6%	0.4%	0.6%
<i>Other</i>	3.0%	2.0%	2.5%

More than 1 in 10 youth (11.1%) surveyed reported that they considered suicide in the last year and 4.9% made a plan to attempt suicide.

Of those who attempted suicide, 17.2% had attempts that resulted in injury. The majority of those who attempted did so only once.

Number of Suicide Attempts in the Past Year (12 Months)

	0 times	1 time	2 or 3 times	4 or 5 times	6 or more times
<i>How many times did you actually attempt suicide?</i>	95.1%	2.8%	1.4%	0.2%	0.5%

The YRBS (2019) was the national comparison for high school students only and Missouri numbers were lower than the national numbers across all questions.

Percent of Students Reporting Suicidal Behavior – High School ONLY

	2020 MSS	2019 YRBS
<i>Seriously Considered</i>	11.9%	18.8%
<i>Made a Plan</i>	8.7%	15.7%
<i>Attempted</i>	4.9%	8.9%
<i>Attempted Resulting in Injury</i>	0.7%	2.5%

## Resiliency

The majority of students “agreed” or “strongly agreed” with the questions about knowing where to get help, feeling optimistic, and handling stress well. However, more than 1 in 4 were unsure of where to get help and almost half didn’t feel like they had healthy coping mechanisms.

Resiliency Factors

	Strongly disagree	Disagree	Agree	Strongly Agree
<i>I know where to go in my community to get help.</i>	12.7%	17.2%	47.5%	22.7%
<i>I feel optimistic about my future.</i>	9.9%	16.0%	43.6%	30.5%
<i>I feel that I handle stress in a healthy way.</i>	18.4%	27.1%	37.7%	16.8%

# CHAPTER 5- EDUCATIONAL ENVIRONMENT

## Perceptions & Attitudes toward School

The majority of youth agreed that students of all races and ethnicities were treated fairly, that rules were enforced fairly, and that teachers noticed when the student was doing a good job. However, less than 4 in 10 students say the school notified the student's family when they are doing a good job.

The percentage of students that "agreed" or "strongly agreed" that rules were enforced fairly decreased over time (78.5% in 2016, 65.6% in 2018, and 62.0% in 2020).

Perceptions and Attitudes Toward School by Youth

	Strongly disagree	Disagree	Agree	Strongly Agree
<i>My teacher(s) notice(s) when I am doing a good job and let me know about it.</i>	5.5%	20.0%	57.4%	17.0%
<i>The school lets my parents know when I have done something well.</i>	22.3%	39.2%	30.2%	8.2%
<i>In my school, rules are enforced fairly.</i>	11.3%	26.6%	49.1%	12.9%
<i>In my school, students of all races and ethnic groups are treated equally.</i>	7.4%	13.0%	46.9%	32.7%



## School Performance

Almost all youth surveyed reported they were making at least passing grades, with half reporting having received mostly A's.

### Average Grades Last School Year

	Mostly F's	Mostly D's	Mostly C's	Mostly B's	Mostly A's
<i>What were your average grades?</i>	1.0%	2.0%	13.4%	33.3%	50.3%

Only 2.9% of students reported being suspended from school in the past 3 months.

### Number of Times Youth were Suspended from School in the Past Three Months

	Never	1-2	3-5	6-9	10-19	20-29	30-39	40 +
<i>Been suspended from school</i>	97.1%	1.8%	0.6%	0.2%	0.3%	0.0%	0.0%	0.0%

More than 1 in 4 (29.1%) students reported skipping at least one day of school in the past month. Of those students, the majority reported skipping only 1 or 2 days.

### Number of Days Youth Skipped or Cut School in the Past Month

	0 days	1 or 2 days	3 to 5 days	6 to 9 days	10 + days
<i>How many whole days have you missed school because you skipped or cut?</i>	69.9%	20.0%	7.6%	1.9%	0.7%

The majority of students did not report missing school due to feeling unsafe, which was slightly less than the national survey (High school students only: 5.8% MSS, 2020 compared to 8.7%, YRBS, 2019). However, 15.7% of all students “disagreed” or “strongly disagreed” that they felt safe at school.

### Number of Days Youth Skipped Due to Feeling Unsafe in the Past Month

	0 days	1 day	2 to 3 days	4 to 5 days	6+ days
<i>How many whole days have you missed school because you felt you would be unsafe at school or on your way to or from school?</i>	94.1%	2.9%	1.9%	0.3%	0.8%

### Perceptions of School Safety in the Past Three Months

	Strongly disagree	Disagree	Agree	Strongly Agree
<i>I feel safe at school</i>	3.9%	11.8%	60.4%	23.8%

# Appendix A – Survey Wording 2020

Comparison tables from 2006 to 2020 and copies of the surveys are available at <https://dmh.mo.gov/alcohol-drug/missouri-behavioral-health-epidemiology-workgroup>

# Appendix B - 2020 MSS Weighting

## Introduction

The Missouri Student Survey (MSS) has been administered during the 2019-2020 school year by the Missouri Institute of Mental Health (MIMH). The questionnaire asked about students' tobacco, drug, and alcohol use. Topics on bullying, fighting, mental health, suicide, and other information were also covered in the survey. In addition, thoughts, feelings, and opinions about themselves, schools, and friends were surveyed.

The MSS target survey population was students in grades 6 through 12 enrolled in regular public and charter schools. Special education buildings, juvenile justice centers, alternative schools, and Missouri Schools for the Blind and Deaf were excluded. Schools with less than 60 students in grades 6 through 12 were also excluded. The sampling frame contained 1290 schools with 472,693 students enrolled in grades 6 through 12.

The MSS was a two-stage cluster sample, with schools selected in the first sampling stage and classrooms sampled in the second stage. All students in the sampled classrooms were asked to participate. To ensure good geographic representation, the sampling frame was sorted by 6-digit county district codes prior to sampling of schools. A total of 96 schools consisting of 48 high schools and 48 middle schools were selected systematically with probability proportional to size (enrollment in grades 6 through 12) using a random start. From each school, approximately 60 students (3-5 classes) were selected. All classes meeting during a particular period of the day or all classes in a required subject, depending on the school, were included in the class list. Systematic equal probability sampling with a random start was used to select classes from each school that participated in the survey. Classes were selected based on randomly generated numbers provided by MIMH.

## Response Rates

For the two-stage sample, the overall response rate was computed as the product of school response rate and student response rate. The response rates were computed as

$$\text{School response rate} = \frac{\text{number of eligible participating schools}}{\text{number of eligible sampled schools}}$$

$$\text{Student response rate} = \frac{\text{number of eligible participating students}}{\text{number of eligible sampled students in participating schools}}$$

Of the 96 sampled schools, 45 schools participated, or a school response rate of 47%. A total of 2,324 students participated. However, the actual number of eligible sampled students was not known for some of the participating schools for one of the two following reasons: (1) some schools surveyed more classes that were originally planned, resulting in the number of completed surveys greater than the required number of eligible

sampled students; (2) some schools failed to use all eligible classes for sampling. As a result, some students (those not on the class list) should have been sampled but did not have a chance of selection.

To correct the selection bias to the extent possible, two types of estimation were made to the number of eligible sampled students for calculating student response rate and for weighting:

1. For schools where the number of completed surveys was greater than the originally planned number of sampled students, the number of sampled students was estimated. The average student response rate for the remaining schools (0.77) was used to estimate the number of sampled students as follows:

$$\text{Estimated number of sampled students} = \frac{\text{number of completed surveys}}{\text{average student response rate}}$$

2. For schools that sampled from incomplete class lists, the number of students who were not included on the class lists was estimated. A within-school sampling interval of 60 students (based on the average number of sampled students from schools that used complete class lists) was applied to the estimated number of students missing from the class lists.

The number of sampled students (some were estimated), number of completed surveys, and student response rate by participating school are shown in Appendix A. The total number of sampled students (some were estimated) was 3,020, resulting in a student response rate of  $2,324/3,020 = 76\%$ . The overall response rate for the MSS was 38%.

## Weighting

A weight was associated with each questionnaire to reflect the likelihood of sampling each student and to reduce bias by compensating for differing patterns of nonresponse. The weight used for estimation was given by:

$$W = W1 * W2 * f1 * f2 * f3$$

W1 = the inverse of the probability of selecting the school;

W2 = the inverse of the probability of selecting the classroom within the school;

- f1 = a school-level nonresponse adjustment factor calculated by school level (middle school, high school), school size category (small, medium, large). The factor was calculated in terms of school enrollment instead of number of schools;
- f2 = a student-level nonresponse adjustment factor calculated by school;
- f3 = a post-stratification adjustment factor calculated by gender within grade and by race/ethnicity.

The sum of final weights for the 2,324 respondents was 416,692, representing the number of students in grades 6 through 12 in regular public and charter schools in Missouri.

Each component of the analysis weight,  $W$  is described in the following sections.

### **School Base Weight (W1)**

Schools were selected with probability proportional to size, with size defined as school enrollment in grades 6 through 12. A base weight was calculated for each school as

$$W1 = \frac{\text{Total grades 6 through 12 enrollment in the sampling frame}}{n * \text{grades 6 through 12 enrollment in the school}}$$

where  $n$  is the number of schools required in the sample = 96; total grades 6 through 12 enrollment in the sampling frame = 472,693. The school base weights are shown in Appendix B.

### **Within-School Base Weight (W2)**

For participating schools, the within school base weight was computed as

$$W2 = \frac{\text{grades 6 through 12 enrollment in the school}}{\text{number of eligible sampled students}}$$

The student base weights are provided in Appendix B.

### **Weighting Adjustments**

Adjustments were made to the initial weights to remove bias from the estimates and reduce the variability of the estimate. The weighting process for the MSS involved three adjustments to the base weights. Two adjustments were made to account for nonresponse in the sample and one adjustment was made to align the weighted sample estimates to known population characteristics that could affect responses to survey questions. Each of these adjustments is summarized below.

### **School-Level Nonresponse Adjustment Factor (f1)**



The first adjustment was made at the school level to account for nonparticipating schools that were sampled. To adjust for school nonresponse, each sampled school was assigned to one of six adjustment cells, based on school setting (middle school, high school) and school size derived from enrollment in the target grades, the schools with less than 151 total enrollment were assigned to small, between 150 to 300 total enrollment were assigned to medium, and greater than 300 total enrollment were assigned to large. Within each adjustment cell, weights of refusing schools were distributed to the participating schools.

For each cell, a school-level nonresponse adjustment was calculated as

$$\text{School adjustment factor} = \frac{\sum_{\text{sampled schools}} \text{school base weight} * \text{school enrollment}}{\sum_{\text{participating schools}} \text{school base weight} * \text{school enrollment}}$$

There were three cells, two middle schools and one high school, had high adjustment factors (greater than 2) to collapse with other middle school and high school cells for calculating the final adjustments. Table 1 presents the school adjustment factors for middle and high schools.

Table 1. School adjustment factor

School adjustment cell	School level	Size category	Number of responding schools	School adjustment factor
1	Middle school	Large	9	2
2	Middle school	Medium	1	2
3	Middle school	Small	10	2
4	High school	Large	20	1.75
5	High school	Medium	4	1.99
6	High school	Small	1	1.99

### Student-Level Nonresponse Adjustment Factor (f2)

The second adjustment was made at the student-level that accounted for eligible students enrolled in sampled classes who failed to complete a questionnaire (e.g., students who were absent on the day the survey was administered, students who did not receive parental permission, students who refused to participate, or questionnaires that failed the edit and quality control checks). Weights of these nonresponding students were given to responding students in the same school.

Adjustment cells for the student-level adjustment were defined by school. Cells with low frequencies (less than 15 students) or very high adjustment factors (greater than 2.5) were collapsed with other cells in the same school level and school size category.

Within each adjustment cell, a student nonresponse adjustment factor was computed as

$$\text{Student adjustment factor} = \frac{\sum_{\text{eligible sampled students}} \text{student weight}}{\sum_{\text{completed surveys}} \text{student weight}}$$

where student weight = School base weight \* School adjustment factor \* Within-school base weight  
= W1 \* f1 \* W2.

A total of 43 cells were formed. The student adjustment cells and the adjustment factors are shown in Appendix C. Cells with more than one school indicated that schools were collapsed for student nonresponse adjustment so that the resulting adjustment factor was less than 2.5. Student adjustment factors ranged from 1.01 to 2.42.

### Post-stratification (f3)

The final weighting step adjusted the nonresponse-adjusted weights so that weighted sample totals aligned with known population totals for variables that could affect response to survey questions. Raking ratio estimation, also known as iterative post-stratification or raking was used to adjust the weights to population totals. For the MSS, population enrollment totals were created by grade and gender as well as by race/ethnicity. The population enrollment totals for grade by gender and the computation of the post-stratification weight are shown in Table 2. Each responding sampled student was also assigned to an adjustment cell based on the grade and gender reported in the questionnaire as shown in Table 2.

Table 2. Population enrollment and total sample for grade by gender and the weight computation

Grade & Gender	Population	$P = \frac{\text{Population}}{\text{Population Total}}$	Sample	$S = \frac{\text{Sample}}{\text{Sample Total}}$	Weight P/S
6 <sup>th</sup> Male	32,174	0.07	333	0.14	0.49
6 <sup>th</sup> Female	30,205	0.07	337	0.15	0.48
7 <sup>th</sup> Male	32,548	0.07	176	0.08	0.92
7 <sup>th</sup> Female	31,523	0.07	164	0.07	0.99
8 <sup>th</sup> Male	33,337	0.07	169	0.07	0.96
8 <sup>th</sup> Female	31,032	0.07	149	0.06	1.09
9 <sup>th</sup> Male	34,854	0.08	167	0.07	1.11
9 <sup>th</sup> Female	32,924	0.07	180	0.08	0.90
10 <sup>th</sup> Male	33,778	0.08	170	0.07	1.09
10 <sup>th</sup> Female	32,002	0.07	178	0.08	0.91
11 <sup>th</sup> Male	31,514	0.07	104	0.04	1.56
11 <sup>th</sup> Female	30,614	0.07	96	0.04	1.69
12 <sup>th</sup> Male	30,796	0.07	46	0.02	3.52
12 <sup>th</sup> Female	29,830	0.07	45	0.02	3.60
<b>Total</b>	<b>447,131</b>		<b>2,314</b>		

“Other” race-ethnicity included Hispanic/Latino, American Indian/Alaska Native, Asian, Native Hawaiian/other Pacific Islander, multiple-Hispanic, and multiple-non-Hispanic. The population enrollment and sample totals for race/ethnicity and the computation of the post-stratification weight are shown in Table 3. Multiplication of post-stratification weight of Gender and race/ethnicity was determined the final post-stratification weight for the sample.

Table 3. Population enrollment and total sample for race/ethnicity and the weight computation

Race-Ethnicity	Population	$P = \frac{\text{Population}}{\text{Population Total}}$	Sample	$S = \frac{\text{Sample}}{\text{Sample Total}}$	Weight P/S
Non-Hispanic White	348,281	0.77	1523	0.67	1.15
Non-Hispanic Black	72,952	0.16	263	0.12	1.38
Other	25,897	0.05	484	0.21	0.23
Total	447,130		2,270		

Occasionally, a completed questionnaire might have missing responses for the items used in raking. For raking purposes, missing responses for grade, gender, and race/ethnicity were imputed so that all responding sampled students could be assigned to an appropriate adjustment cell. Hot-deck imputation was used, where students with missing items (recipients) were filled in with reported items from other students (donors). Donors and recipients were grouped into imputation cells that were similar in some auxiliary variables (boundary variables). Within each imputation cell, donors and recipients were matched randomly.

Missing grade was imputed within school based on the age of the student. For imputing gender and race/ethnicity, boundary variables were chosen such that they were highly significantly related to the imputed variable of interest, based on Chi-Square analysis, and had relatively small number of missing values. For gender, the following boundary variables were selected:

- Q37\_1 (In the past 30 days how often were you very sad?)
- Q34\_1\_0 (During the past 12 months, how many times were you in a physical fight?)
- Q58 (Have you ever used chewing tobacco such as Redman, Levi Garrett, Beechnut, Skoal, Skoal Bandits, or Copenhagen or snuff (dip), even once?)

The following boundary variables were used to form imputation cells for race/ethnicity imputation:

- Q7 (What is the language you speak most often at home?)
- Q34\_1\_0 (During the past 12 months, how many times were you in a physical fight?)
- Q16 (What were your average grades last school year?)

The Chi-Square test statistic and p-value for the boundary variables are shown in Table 4.

Table 4. Significance of boundary variables

Variable	Used for imputing	Chi-Square statistic	Degrees of freedom	p-value
Q37_1	Gender	190.00	4	<.0001
Q34_1_0	Gender	59.70	7	<.0001
Q58	Gender	19.41	1	<.0001
Q7	Race/ethnicity	615.86	6	<.0001
Q34_1_0	Race/ethnicity	44.87	21	<.01
Q16	Race/ethnicity	42.28	12	<.0001

The boundary variables had missing values in themselves. They were imputed first in a sequential manner. For example, for imputing gender using Q37\_1, Q34\_1\_0, and Q58, missing values for Q37\_1 were imputed using Q34\_1\_0 and Q58. Once Q37\_1 was imputed, Q34\_1\_0 was then imputed using the complete Q37\_1 data and Q58. Following the imputation of Q34\_1\_0, Q58 was imputed using the complete Q37\_1 and Q34\_1\_0 data. After all three boundary variables had been imputed, gender was imputed using the complete Q37\_1, Q34\_1\_0, and Q58 responses.

For the MSS, the imputed values were used for weighting only. Values of these imputed variables were not included in the delivery data file.